A tiered model of substance use severity and life complexity : potential for application to needs-based planning

BARKER, S. Fiona, BEST, David <http://orcid.org/0000-0002-6792-916X>, MANNING, Victoria, SAVIC, Michael, LUBMAN, Dan I. and RUSH, Brian

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ABSTRACT. *Background:* In order to improve long-term outcomes for individuals with substance use problems, one approachto adopt a system planning model that considers both addiction severity and life complexities. The tiered approach has been developed and tested to modelsystems-level need based on levels of risk and problem severity. *Methods:* An existing tiered model was modified to accommodate Australian data, incorporating substance use severity and life complexity. The hypothesis was that tiers would reflect differences in wellbeing amongst help-seekers such that an increase in tier would be associated with a reduction in wellbeing suggesting the need for more intensive (and integrated) interventions. The model was tested using two datasets of screening data, collected from face-to-face alcohol and other drug (AOD) services (n=430) and online help-seekers (n=309), drawn from a larger sample of 2,766 screens. The screen included demographic information and substance use, mental health and quality of life measures.*Results:* There was a significant relationship between wellbeing and tier ranking, suggesting that the model adequately captured elements of severity and complexity that impact on wellbeing. There were notable differences between the help-seeking populations with a higher proportion of online respondents allocated to lower tiers and more face-to-face respondents allocated to higher tiers. However, there was an overlap in these populations with more than half of online respondents classified as higher tiers and one fifth of face-to-face respondents classified as lower tiers. This suggests that the model can be used both to assess unmet need in out-of-treatment groups, and demand in the absence of dependence in a sub-population of the face-to-face treatment population. *Conclusions*: The tiered model provides a method to understand levels of AOD treatment need and, as part of needs-based planning, may be used to optimise treatment responses and resourcing.

Keywords: Alcohol; drug; online; policy; treatment system; treatment tiers

INTRODUCTION

There is a robust body of evidence that there are a range of additional life issues that affect engagement and retention in alcohol and other drug (AOD) treatment and subsequent client outcomes. Neale et al. [1] reported that clients in AOD treatment identified 'wellness' goals including improved relationships, engagement in meaningful activities, acquiring material possessions, and achieving better mental and physical health, as central to their treatment objectives. It is increasingly recognised that a comprehensive approach that addresses important areas of functioning in addition to AOD issues is needed to improve long-term outcomes [2,3], especially for clients with multiple needs. There is widespread recognition of comorbidity of mental health and substance use issues; however, there is less work dealing with other common factors such as housing, relationships, financial issues, etc., despite evidence that their resolution is essential for the long-term wellbeing of individuals with substance problems

A broader approach to treatment planning, that accounts for such factors, is a cornerstone of the needs-based planning work developed by Rush et al. [4]. This model conceptualised the severity of substance use problems as composed of *acuity* (short duration and/or urgent risks or adverse consequences), *chronicity* (development or worsening of long duration or enduring conditions), and *complexity* (degree of co-occurrence of the acute or chronic index problems and/or the existence of health and social factors such as homelessness, unemployment, family dysfunction that complicate the process of addressing the index problem(s)) [5]. The concept of life complexities has been incorporated in the development of the Recovery Diagnostic Toolkit [6,7], which is used to provide population-level analysis of AOD clients as part of a local needs assessment. Complexity is also a key

component of the treatment planning tool, Addiction Dimensions for Assessment and Personalised Treatment (ADAPT), which has been developed for use in the UK [8].

The needs-based planning work, undertaken by Rush and colleagues, used a tiered framework to model and segment help-seeking populations. The tiered framework is a broader systems approach that can be used to classify individuals into pre-defined tiers or categories of treatment need and provides information about the nature of a population of interest (people with AOD issues in this case). Rush et al. [4] applied this logic to the substance use services and supports in Canada and developed a five-tiered model that describes a spectrum of substance use problem severity and life complexity issues defined by risks and harms in the general population. The five tiers are described as: low risk, moderate risk, active risk/harm, chronic harms, and complex/high severity. The Rush tiered model also incorporates a population health approach of 'broadening the base of treatment' with an increased emphasis on health promotion, prevention, early intervention, and reduction of stigma and discrimination. As such, this systems approach to substance use treatment planning, coupled with a population health perspective, allows for those with less severe needs to be engaged outside the specialist AOD sector which facilitates the reduction in waiting times and enables additional attention within AOD services to be focussed on complex, co-occurring conditions that require a multidisciplinary approach [9]. Needs-based planning therefore provides health service managers, policy makers and commissioning bodies with the ability to assess the composition of need across the populations they serve, and to ensure that adequate resources are available to meet need as it changes over time. An opportunity to replicate this work arose with the reform of the alcohol and drug treatment system in Victoria, Australia. Following an initial consultation in 2012, in response to criticisms from the Victorian Auditor General's Office (VAGO, 2011), a locality based model

was proposed and implemented in "Reducing the alcohol and drug toll: Victoria's plan 2013-17 (Department of Health, Victoria, 2012). Two of the key commitments of the document around treatment were to "test the use of an alcohol and drug misuse screening in the xxx trial sites and develop improved effective coordination of evidence-based,standardised screening and assessment methods to support clients wanting to access services and improve pathways for clients into specialist alcohol and drug services" (Department of Health, 2012, p53) and to "deliver more personalised help for vulnerable Victorians with complex support needs that can include drug and alcohol use, mental health issues,homelessness and financial insecurity"(Department of Health, 2012, p53).

This resulted in a two-stage process for assessment - an initial screening (that could be done face to face or online) followed by face-to-face assessment for those deemed suitable. Part of the aim of the screening process was to identify those whose needs could be met with less intensive AOD interventions, or who were more suited to referral to non-AOD services. All clients screened as having a likely AOD dependence were referred to specialist services for full assessment by an experienced clinician who would use the screening information, along with a standardised assessment measure, and their clinical judgement to determine appropriate onward referral. The reform also led to the creation of a new specialist role in Victorian treatment services, that of Care and Recovery Co-ordinator, whose job was to address the second objective outlined in the policy document, to provide intensive support, and care coordination where needed, to the clients identified as having the most entrenched and complex problems. They will be responsible for referral both to non-AOD specialist agencies (such as mental health and housing) but also to coordinate the appropriate level of specialist AOD intervention. The authors were able to access the screening data produced

from the online part of this system reform in Victoria, and to the face to face screens carried out in the pilot phase of this work on behalf of the Victorian Department of Health.

This paper had three aims: (1) To describe how we adapted the Rush tiered model for use with routinely collected AOD screening data in Victoria, Australia; (2) To apply the adapted model to AOD screening data collected in two settings (face-to-face and online) and to compare the distribution of tier allocations between these settings; and (3) To examine whether individual tier ranking is correlated with scores on a measure of wellbeing. We have assumed that individuals with greater problem severity and more complex life issues will report poorer wellbeing, and we have used this as an indicator of greater need for treatment and additional supports. To our knowledge no previous attempts have been made to apply a tiered model to the Australian AOD sector, nor to test the resulting Tier allocation against independent measures of client wellbeing.

METHODS

This model was developed based on routinely collected AOD screening data. In 2011, an adult AOD screening tool was developed, integrating a range of well-established, standardised screening instruments to be used by clinicians and clients attending AOD services in Victoria, Australia. Instruments were selected on the basis of reliability, brevity, ease of use and ability to be used by a range of different population groups, and to measure alcohol and drug problem severity (AUDIT and DUDIT[12,13]), psychological distress (Kessler K10[15]) and measures of wellbeing (refer to Supplementary Material for more detailed descriptions of the instruments and the relevant threshold values). The wellbeing measures were taken from the Australian Treatment Outcomes Profile (TOP) [19], a recent modification of the UK TOP [20], consisting of 3 questions relating to psychological and physical wellbeing, and overall quality of life (scored from 0 to 10, where 10 is the highest level of self-reported

wellbeing). As a complement to face-to-face screening, a self-complete online tool was developed and made available on two websites, a state-based AOD treatment provider [removed for blind review] and a national online AOD counselling service [removed for blind review], and included the same core measures as those included in the face-to-face screening tool. Visitors to the websites navigated to the screen from either a link on the home page (state-based website) or by browsing through the resources page on the national website. No external marketing of the web site or any other form of recruitment was used and no incentives were offered to participants for completing the screen. Screening data was collected from eight face-to-face AOD services (seven community based alcohol and drug treatment providers who responded to a request for participation in the pilot study and completed the staff training component of the implementation of the screening process) as part of a pilot between May and December 2012 while data from online screens was collected between December 2012 and December 2013. This research received ethical approval from [removed for blind review].

Modification of the Rush tiered model

A tiered framework to describe Australian help-seeking populations was developed, based on the five-tiered model developed by Rush et al. [10] that included substance use (DSM-IV criteria for dependence) and measures related to mental health. We built upon the Rush tiered model using screening data available in Victoria, Australia, that allowed us to segment clients on the basis of their problem severity and life complexity (Figure 1). In our model, problem severity is defined using established cut off scores from the AUDIT and DUDIT (Alcohol and Drug Use Disorders Identification Tests; Table 1 - Supplementary Online Material) [11-13] and life complexity is defined using a complexity score. The complexity score concept was informed by recent work in the UK [6,14] and is a simple representation of the

number of complexity factors identified in a client profile. The complexity score developed for this model combines factors that are important contributors to poor wellbeing: high psychological distress (defined by ABS [15] as a score of ≥ 30 on the Kessler Psychological Distress Scale (K10)), housing instability (homelessness or boarding house residence) and an absence of meaningful activity (represented by unemployment) [1,16-18], for a maximum score of 3. Our tiered model does not specifically identify life complexities in Tiers 1 and 2 as it was developed for individuals requiring AOD treatment. Our model provides an initial indicator of likely treatment need where Tiers 1 and 2 describe substance users that are non-dependent and who may be appropriate candidates for prevention and early-intervention; Tier 3 describes substance users that are likely to be substance dependent with no other life complexities and may be suited to brief interventions for dependence; and Tiers 4 and 5 describe substance users that are likely to be substance dependent with a continuum of life complexity issues, with Tier 5 representing highly complex individuals likely in need of greater and more urgent support.

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Figure 1. Australian tiered model.

Testing the model

The hypothesis of this work was that the tiered model would reflect differences in measures of wellbeing amongst individuals seeking help, such that an increase in tier would be associated with a reduction in quality of life and wellbeing. We tested the model using the two available datasets of screening data (face-to-face AOD services and online help-seekers).

These datasets were selected to provide a spectrum of help-seekers in an effort to provide adequate coverage across the five tiers of the model.

High completion rates (online <1% missing; face-to-face ≤11% missing) were obtained for the core questions related to AOD use (AUDIT; DUDIT; Alcohol, Smoking, and Substance Involvement Screening Test ASSIST; [21]), wellbeing and psychological health (ATOP; [19]; K10[15]), and selected demographic information (age, gender, Aboriginal and Torres Strait Islander (ATSI) status, cultural background). Questions related to user profile (employment, residence, previous AOD service use, care of children) were also included in the screen and face-to-face respondents had high completion rates (>90%). In the online screen, these questions were included as part of an optional user satisfaction section to minimize the duration of screening; this resulted in a low response rate (14%). Amongst online respondents, there were no significant differences in those completing vs. not completing the user satisfaction section in terms of ATSI status, Australian cultural background or proportion of youth vs. adults, nor were there differences amongst substance use and wellbeing scores (total number of substances, AUDIT, DUDIT, K10, ATOP). There was, however, a significantly higher proportion of females (56% vs. 44%) amongst those that completed the user satisfaction section ($\chi^2(1)=6.0$, p=0.01).

Statistical analyses

Descriptive statistics—frequencies and means—were used to describe sample characteristics and participants' AOD use. Pearson's χ^2 test was used to test proportional differences in categorical variables while means were compared using independent samples t-tests. Post-hoc analysis of chi-squared tests was conducted using adjusted residuals, where absolute value of 2 or greater identified cells that greater/lesser than expected at p<0.05 [22]. To assess the relationship between tier rank and measures of wellbeing, Spearman's correlation

was used. For calculation of differences between tier ranks, 1-way analysis of variable (ANOVA) was used, followed by Tukey's post hoc test. The significance level for all statistical tests was set at $p<0.05$ and all analyses were performed using Stata version 13.0 (StatCorp LP, College Station, TX) or 'R' version 3.0.2 [23].

The distribution by state was 69% Victoria, 12% New South Wales, 8% Queensland, 4% Western Australia, 4% Southern Australia, 1% Tasmania, 1% Australian Capital Territory, and <1% Northern Territory). The face-to-face cohort was predominantly male (63%) while the online cohort had an even gender split (51% male). Both groups had 17% of respondents under the age of 24 years and low representation by respondents identified as Aboriginal or Torres Strait Islander (ATSI; 3-4%). Most reported an Australian cultural background or country of birth (79% face-to-face, 77% online) and approximately 30% lived with or had care of children. There were similar rates of likely alcohol dependence (45% face-to-face, 41% online); however, the face-to-face group reported higher rates of likely drug dependence (43% face-to-face, 25% online), total number of drugs used (3.5 face-to-face, 3.1 online) and psychological distress (56% face-to-face, 36% online).

Application of the tiered model to the two sample populations

Only those respondents with answers to all tier questions (AUDIT, DUDIT, K10, employed, housing) were included (n=739), accounting for 74% of the face-to-face cohort (n=430) and 14% of the online cohort (n=309). Within this revised cohort (Table 1), the face-to-face group had a significantly higher proportion of males, ATSI respondents, individuals with housing problems, unemployment and previous use of AOD services, compared to the online group. As well, the face-to-face group had significantly higher scores of alcohol use,

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drug use, psychological distress, and total number of drugs used, and poorer scores of psychological and physical wellbeing and overall quality of life, compared to the online group. However, there were similar proportions of youth, Australian cultural background and care of children between the two groups.

---TABLE 1 HERE---

Population segmentation using the tiered model assumes tier ranking indicates variation in treatment need. Allocation to tiers varied significantly between the two groups (χ^2(1)=86.9, p<0.001), with a higher proportion of the face-to-face cohort allocated to Tiers 4 and 5 (70% vs. 35%) compared to the online cohort. Yet despite the generally higher level of AOD problem severity and life complexity amongst face-to-face respondents, 22% were identified as non-dependent (Tier 1 or 2). Similarly, amongst online respondents, 35% were identified as dependent with at least one issue of life complexity (Tier 4 or 5).

Online respondents (Table 2) classified as Tiers 4 or 5 were more likely to have had previous engagement with AOD services and reported higher numbers of drugs used compared to respondents in lower tiers, while face-to-face respondents (Table 3) classified as Tiers 4 or 5 were more likely to have had previous AOD service use.

Amongst face-to-face respondents, 65% of Tier 1 and 77% of Tier 2 had at least one life complexity issue, primarily unemployment (91%) and high psychological distress (35%) with some housing instability (9%). Amongst online respondents, 18% in Tier 1 and 30% in Tier 2 had at least one life complexity, predominantly unemployment (62%) and high psychological distress (50%).

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The model was also tested against our hypothesis that higher tier rank reflects poorer quality of life and wellbeing (i.e. lower scores). Using Spearman's correlation, a moderate negative correlation between tier and psychological wellbeing ($r_s = -0.51$, $p < 0.001$), physical wellbeing ($r_s = -0.46$, $p < 0.001$), and overall quality of life ($r_s = -0.55$, $p < 0.001$) was found. One-way ANOVA was also conducted to determine if wellbeing scores were different for different tier rankings. All wellbeing scores were significantly related to tier rank ($p < 0.001$) for the combined cohort and there was a statistically significant difference between tier ranks for both the online and the face-to-face cohorts. A Tukey post-hoc test revealed that total ATOP scores were statistically significantly lower in higher Tiers for both cohorts; however, in the online group, there were no statistically significant differences between Tiers 2 and 3 and Tiers 4 and 5, while in the face-to-face group there were no statistically significant differences between Tiers 2 and 3 and Tiers 3 and 4.

---FIGURE 2 HERE---

Figure 2. Relationship between tier rank and total ATOP score. Solid dots represent mean values and grey shaded area represents ±1 standard deviation.

DISCUSSION

Assessment of the tiered model and rationale for the respondent populations

In the development of the tiered model, we postulated that higher AOD problem severity and life complexity (as reflected by higher tier ranking) would be associated with lower quality of life and wellbeing. In assessing the model we found that there was a significant relationship between measures of wellbeing (ATOP scores) and estimated tier

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ranking. This, and the finding that respondents in higher tiers reported using a significantly higher number of drugs and were more likely to have both alcohol and drug problems, provides a level of validation for the model. Additionally, this suggests that our model adequately captured elements of severity and complexity that impact on individual wellbeing, which is one indicator of variation in treatment need. This indicates that the Rush tiered model may be adaptable to different contexts and datasets, although further testing with different datasets will be required to determine the robustness of the model.

The selection of the respondent populations for evaluation of the model was informed by the need to capture a broad spectrum of severity and complexity. The aim was to encompass the profile of current AOD treatment-seekers from face-to-face settings, as well as the predominantly treatment naïve online help-seekers. The results suggest that the tiered model can be used with online assessment tools, thus potentially extending the applicability of the tiered approach to out-of-treatment and difficult to access groups.

There were notable differences between the two help-seeking populations, but also some overlap. As anticipated, online help-seekers were generally characterised by lower AOD problem severity, greater wellbeing and fewer life complexities, although a significant proportion reported scores that suggested likely dependence. In fact, more than half were classified as Tier 3 or higher suggesting suitability for assessment and potentially specialist AOD treatment. Given that the majority of online respondents reported no previous engagement with AOD services, these screening data provide a preliminary understanding of a sub-population with unmet needs and highlights the potential of online tools, such as an online screen, to provide new pathways into treatment for hidden populations.

Face-to-face help-seekers had higher rates of likely dependence, poorer wellbeing and more life complexity issues; however, 22% were non-dependent (Tier 1 or 2), suggesting that the needs of this sub-population might be more appropriately met online (i.e. with lower intensity interventions such as telephone or online counselling) or by other service providers, such as primary care and mental health services. However, it is important to note that there is marked overlap in wellbeing across the two populations, possibly reflecting some level of significant unmet need in the online population and/or a proportion of people accessing face to face treatment with lower thresholds for help-seeking. However, we also cannot assume a perfect association between help-seeking processes and wider issues of health and wellbeing, nor that there is sufficient sensitivity in a 10-point ruler score to prevent some level of overlap in score profiles.

More efficient strategies for identifying and re-directing this group, such as integrated working or screening in both AOD and non-AOD services, could provide resource savings and/or facilitate more effective use of specialist AOD services for those with more complex conditions requiring higher intensity treatment.

In both populations, these results suggest that there was a significant proportion of help-seekers who experienced a mismatch between their need for AOD treatment and their expression of demand (as reflected by their initial point of contact). This suggests that there are opportunities both for expansion of new points of engagement for help-seekers and more effective processes to identify and direct help-seekers to appropriate assessment and interventions suited to their level of need. It also suggests that the model can be used both to assess unmet need in out-of-treatment groups, and demand in the absence of dependence in a sub-population of the face-to-face treatment population; this double function of linking needs

to assessment data may be particularly important to treatment planners at a commissioning level.

Limitations

Our study was limited to data collected from two opportunistic yet distinct populations of help-seekers primarily from [REMOVED] which may not be representative of the broader Australian population or other international communities. The anonymous nature of the online screen meant we had only limited information on where the respondents had come from, and it is likely that a small proportion of the screens were completed by people seeking help for family members or friends, and this group were not identified and so could not be excluded. However, the self-selected nature of our sample is a point of differentiation from randomized controlled trials assessing the efficacy of online screening and brief intervention, which primarily recruit student samples [24]. In addition, the majority of the screen information is self-completed and as such could not be validated with objective measures, and is not compatible with the DSM-V criteria which have been published since the project was undertaken in Victoria. However, we are not suggesting the online group is representative of the general population. Another limitation is that the sample size for the testing of the tiered model was limited (n=739), although comparative analysis suggested they were generally representative of the broader total sample.

Additionally, , the complexity factors were selected based on availability of data and do not represent all indicators of complexity as this initial pilot was to assess the viability of the screening model and the resulting tiers profile. As such, the model may not accurately represent client complexity and therefore may under/over-estimate population levels of AOD treatment need. However, all clients screened at Tier 3 or above are recommended for full face to face assessment with an experienced clinician and the screen is designed only to

provide a population-level indicator of client profiles and an opportunity to divert non-dependent participants to lower threshold interventions.

Application of the model and next steps

The funding of specialist AOD treatment services and supports has traditionally occurred in the absence of a systems-level needs-based planning model to assist in the allocation and distribution of resources based on the types of services and the in-need populations. With ever-increasing financial constraints, there is a need to more efficiently use limited resources. Needs-based planning at a population level can provide a systematic analysis of need to inform many of these important planning decisions.

As a starting point, the tiered framework represents "the levels of risks and harms related to substance use as distributed in the general population" and tiers should be considered as multiple levels of severity that require a "collection of functions that are required in comprehensive treatment systems in order to minimize the levels of risks and harms of people in these categories" [4]. One of the key strengths of the current approach is that it uses data from a screening tool that can be self-completed and can be used with both in- and out-of-treatment populations as a means of assessing unmet need. As such, the tiered model can provide an easy-to-understand snapshot of the help-seeking population in a particular area. As well, by understanding the tier-mix of clients in any one location, it could be used to help service managers assess gaps in service provision and plan their services more effectively. The primary purpose is to allow systems-level mapping of need (and one of the purposes of the online screen is to look at the profile of dependence and linked complexity in the out-of-treatment online group), rather than for case allocation. Only when participants are screened as non-dependent is there a preliminary decision taken not to refer

to full assessment if the participant is in agreement. It has been made clear to policy makers and clinicians that this is not a clinical instrument.

In developing this preliminary model, we used a flexible approach that built upon the Rush tiered model using available data. While the model structure was similar and used a broader definition of complexity, it was developed within the constraints of available data. The tiered model applied d here is intended as a test of the feasibility of using this approach with the data available in Victoria, and on that basis we are now looking to access additional data sources to provide a more sophisticated measure of complexity beyond the three that were available when preparing this paper. We will also consider the implications of the publication of DSM-V in the further development of this work. as part offuture work which will explore its application to a broader set of data and consideration of additional measures of life complexity. Future application includes the potential for regular needs-based assessments using the tiered model, to enable policy makers and planners to not only monitor changes in need and demand but also to evaluate whether the responses to addressing any disparity between need and service provision are effective. There is an obvious need for more informed decision-making related to resource allocation in the AOD sector and the tiered model provides a valid starting point for needs-based assessment. This model could be a useful tool to assist planners and policy makers to optimise treatment responses and resourcing.

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